SSGIC

General Meeting
April 17, 2002
Central California Interagency Communications Center – Porterville, CA

Overview

The Southern Sierra Geographic Information Cooperative (SSGIC) is an interagency cooperative with five primary stakeholder agencies, Bakersfield BLM, CDF-Tulare unit, Kern Co. Fire Dept., Sequoia National Forest, and Sequoia & Kings Canyon National Parks. The project's primary goal is to develop a landscape scale framework for interagency fire management planning. Over the past 2 years, much of the effort has focused on data development and analysis. With these nearing completion, the focus will shift to disseminating information and developing applications useful to the fire management community. The SSGIC website is located at http://ssgic.cr.usgs.gov. Appendix A is a list of meeting participants. **Bold** text indicates an action item.

Analysis Updates

The SSGIC analysis process includes four analyses that contribute to the final integrated analysis (see charts on page 5). The status of each of these contributing models was reviewed. Each analysis utilizes GIS raster processing and is based on a 30 meter cell size. An evaluation was made of the quality of the source data and validity of assumptions. Priorities were set for improvements.

- FOA (Fire Occurrence Areas) - This analysis represents the potential risk of a fire ignition occurring and is derived from historic ignition data. The FOA has been updated since December 2001 to reflect the addition of Kern County Fire Dept. ignition data. Constraints applied to each dataset include selecting 1981-2000 ignitions, eliminating management fire ignitions, and clipping to Direct Protection Area (DPA) boundaries. Since the Kern County Fire Dept. data was available for only 9 years; this data was duplicated to represent 18 years of historical ignition data. They are continuing digital capture of this data. Both human caused and lightening ignitions are included in the dataset of about 8,000 ignitions. It is available for viewing and download on the web site.

  The decision to clip each agency dataset to its DPA boundary was based on the assumption that ignitions outside these boundaries are more likely to be duplicates of ignitions in another agency dataset or an error than valid. Nearly 1/3 of the total ignition dataset was eliminated by this decision. While the investment required to validate these points would be substantial, it is also recognized that eliminating them may be a significant source of error. However, because of the large database size ($n > 8000$), there is a high degree of confidence in the spatial distributions and patterns.

- FRID (Fire Return Interval Departure) - This analysis is based on research identifying historic fire regimes and provides an index to rank areas based on their deviation from them. It is a measure of the ecological benefits of fire. Source spatial data includes vegetation classification and historic fire perimeters. Non-spatial data includes Fire Return Intervals (FRI) that represent the historical (preEuropean) burn intervals. FRI values were originally assigned to Sequoia and Kings Canyon National Park vegetation codes and have not been developed for the vegetation codes used by other agencies. Consequently, vegetation codes outside the park were cross-walked to Wildlife Habitat Relationship (WHR) vegetation codes and FRI values assigned to these codes. Tony Caprio developed and assigned the crosswalk data for the WHR vegetation codes. In the FRID model, the assigned FRI is compared to the length of time since the last recorded fire. The number of intervals "missed" is calculated as the departure from FRI. The FRID analysis for SSGIC is available for viewing and download on the web site.

  A number of opportunities exist to improve the FRID analysis. These include:

  - Develop FRI values for source agency vegetation codes to eliminate the cross-walk to WHR codes. This is a "lowest common denominator" approach.
  - Improve the level of confidence in FRI values with additional research.
  - Improve vegetation classification data, particularly where only low resolution GAP data are available.
  - Re-evaluate the interpretation of FRID values by vegetation type. The effect of excluding fire is itself dependent on the vegetation community.
  - Expand the FRID model to include additional variables such as aspect and slope that have a significant effect on FRI's.
  - Develop a Disturbance Return Interval Departure (DRID) model to look at current land use and management activities in addition to vegetation types. This would include agricultural activities, fuels treatments, mechanical disturbance, and other alterations to the potential vegetation community.

- FlamMap - This analysis predicts the hazard potential for fire behavior across the landscape. It basically utilizes the same algorithms as the Farsite and Behave models. The initial FlamMap runs for SSGIC utilized spatial data for fuels, canopy cover, and topographic data. Comparison of weather station data from stations within the analysis area displayed insufficient variation to implement more than one weather influence zone. Fuel moisture files were based on Ash Mountain (located in the Kaweah drainage) weather station data. Non–spatial data included weather percentile category, fuel moisture by fuel model, and windspeed derived from weather station data. FlamMap also requires estimates of crown height, crown base height, and crown bulk density to predict crown fire behavior. These can be input as spatial data or constants applied across the entire analysis area. For the initial runs, constants were utilized that suppressed crown fire behavior. Outputs from FlamMap were Rate of Spread (ROS) and Flame Length for each of four weather percentile categories.

Evaluation of the initial FlamMap outputs revealed processing errors that require re-running the model. Additionally, spatial data for crown height, crown base height, and crown bulk density for the Sierra Framework on USFS lands has been acquired. **SSGIC will develop these layers across the entire analysis area prior to re-running FlamMap to allow simulation of crown fires in the next FlamMap runs. FlamMap outputs will be available on the web by June 2002.**

Inadequate fuels data are a limitation for all fire management analysis. Improved fuels data is the top priority to improve FlamMap predictions.

- WFSI (Wildland Fire Susceptibility Index) – The WFSI model integrates outputs from FOA and FlamMap to derive an index of the susceptibility of each cell to wildfire. The analysis area is stratified by FOA category and ignitions predicted based on the historical ignition data in each strata. Using Fire Family Plus, daily weather data is assigned to weather percentile categories based on Spread Component (SC). Each historical fire ignition is linked to the weather data on the day of the ignition and assigned a SC and weather percentile category. For each cell in the analysis area, a Final Fire Size (FFS) is predicted based on the FlamMap ROS output and a regression equation. Finally, the likelihood of an ignition and FFS for each cell are combined and summed across weather percentile categories to calculate the WFSI. This is not an absolute value, but rather an index of susceptibility. **Completion of the WFSI will follow updated FlamMap outputs.**

  The development of the regression equations to relate FlamMap ROS outputs to FFS is an important part of the WFSI process. Contractor Don Carlton met with Corky Conover, (SEKI fuels specialist), Aaron Gelobter (Sequoia NF FMO), Tony Sarzotti (Bakersfield BLM FMO), Diane Travis (Sequoia NF Fire Planner), and Anne Birkholz (SSGIC Program Manager) on April 7, 2002 to develop these equations. Meeting notes are available on the Web site for details of the process used. Data from NFMAS Suppression Table 1 of the IIAA module for contained fires was used for low ROS values. At higher ROS's, fire progression maps from actual escaped fires was used. A maximum FFS was identified for each equation to prevent prediction of unrealistically large FFS's at high ROS's. These were 34,000 acres for Grass/Shrub, 7,500 acres for Mixed Conifer, and 3,500 acres for High Elevation. The data supported the development of three regression equations that will be assigned as follows:

  High Elevation – over 6,000 foot elevation *
  Grass/Shrub – fuel models 1, 2, 3, 4, 5, 6, 15, and 28 below 6,000 foot elevation *
  Mixed Conifer – fuel models 8, 9, 10, 11, 12, and 13 below 6,000 foot elevation *

  Discussion on modifications/improvements to the WFSI centered on the development of equations that would model unconstrained fires in additional to constrained fires and the possible need for more than a single weather influence zone.

  * Addendum – Definition of High Elevation RVS later modified to > 7,500 feet based on subsequent analysis and subject matter expert opinion.

Asset Analyzer Development
The Asset Analyzer originated as a CDF tool to combine spatial data identifying expected losses should a large, damaging fire occur. The user applied relative weights to each resource (e.g. housing weighted more heavily than grazing). The model summed the weighted values across the resources and calculated an aggregate score. At the December 2001 meeting, the SSGIC decided to pursue development of this application including a GUI (Graphical User Interface). As the specifications for the application evolved, a broader scope for the model emerged. The application being developed has utility as a multi-criterion decision making tool that can be applied to a broad range of geographic areas, resources, and datasets. Space Imaging has been contracted to deliver an Avenue Extension for use with ArcView and Spatial Analyst.

The first prototype GUI was demonstrated and recommendations captured. Suggestions included:

- Add the functionality to display contributing dataset values for any cell with a mouse click.
- Allow the user to select the number of categories used for reclassification (maximum of 5).
- Present the user with more information on the unclassified output grid to assist in selecting upper and lower bounds for each category,
- Increase the flexibility of the application to include vector data.
- Improve the handling of "NoData" cell values to assume a "0" value.
- Re-evaluate the approach used to assign weights. Replace the original approach in which the user applied integer values to each dataset independently to an approach where a total of 100 points are possible and each dataset is assigned a portion (percent) of this total.

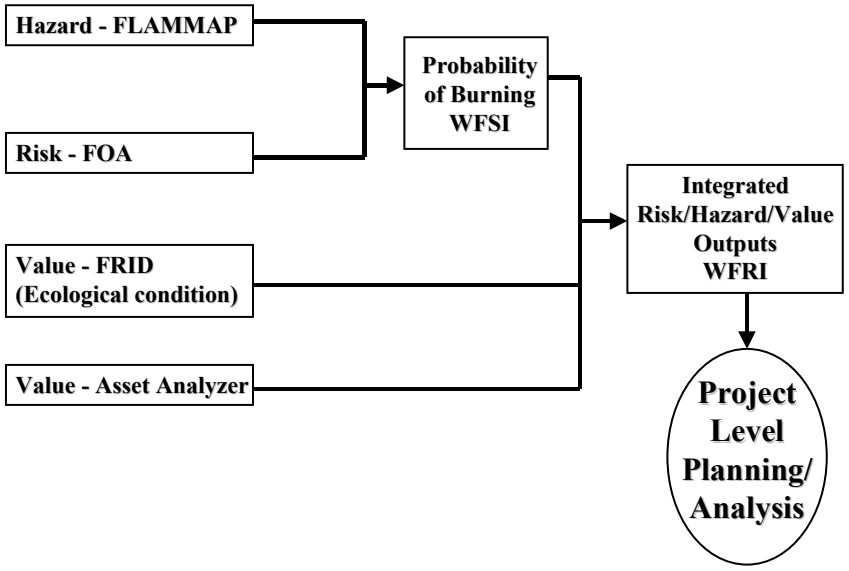
Addressing all of the above issues may or may not fall within the scope of the current contract. Further development of the Asset Analyzer can be considered in the future.

To ensure adequate input from the potential user community during the development phase, **the following teams will beta test the application.**

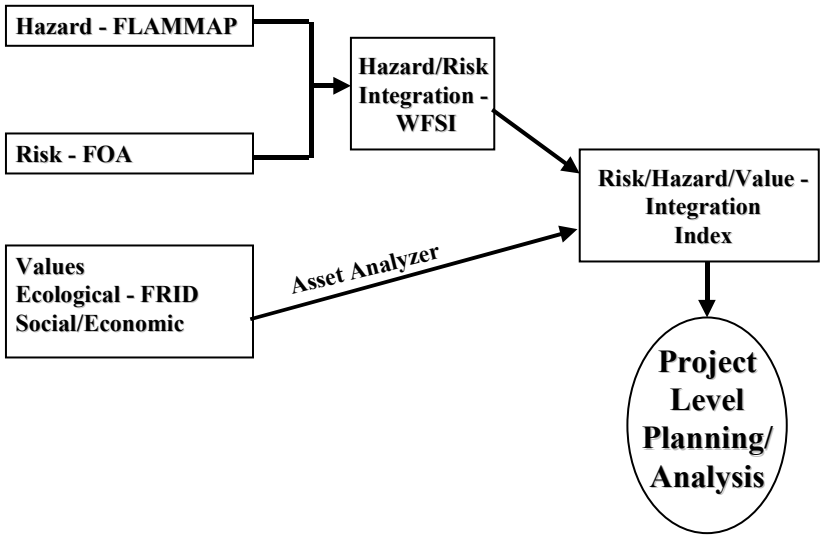
Heidi Hosler and Brent Skaggs (Sequoia NF)
Maria Soto and Tony Sarzotti (Bakersfield BLM)
Jolia Koo and Dave Drum (CDF)
Karen Folger and Bill Kaage (SEKI)

Proposed Modification to the SSGIC Analysis Flowchart
Pat Lineback proposed a modification to the SSGIC analysis flowchart. The change is more conceptual than substantive and primarily reflects the current view of the Asset Analyzer, not as a model in itself, but as a tool for decision making. The new flowchart also indicates a more holistic approach to evaluating "Values", both positive and negative. There was general agreement that both the Asset Analyzer and the final "Integration Index" would benefit from new names; suggestions will be entertained. The proposed flowchart modification was adopted. The diagrams below compare the previous and new flowcharts.

Previous SSGIC Analysis Process



New SSGIC Analysis Process



Process to Implement "Values" analysis and the final "Integration Index"
A process to develop SSGIC wide "Values" was defined. The differing missions of the stakeholder agencies contributes to the difficulty in defining "values" uniformly across the analysis area. **Therefore, each agency will be responsible for developing a "Values" dataset for their agency lands by September 2002. These will be spatially integrated for the final dataset. Anne Birkholz will assist each agency in preparing source datasets for the Asset Analyzer and using the tool.**

A final analysis product, the Integration Index, representing the integration of Hazard, Risk, and Value will be developed at the **October 2, 2002** meeting of the interagency fuels planning group. Potential to utilize the Asset Analyzer as the decision making tool was discussed.

Data Development
The group reviewed the current status of data development both in the context of meeting the program goals established at the outset as well as meeting current analysis needs. In general, seamless datasets are available for the originally identified layers. Exceptions are Powerlines and Special Management Zones (SMZ). Power companies have been reluctant to make this data available and SSGIC will not pursue it. Development of a SMZ dataset will be pursued. **Each agency will provide a list of SMZ data currently maintained and evaluation of the available data will determine how to proceed.**

Further discussion focused on data needs to complete current analyses, including updates needed to existing datasets. The importance of fuels and vegetation data to all analyses warrant continuing investment. Updating and improving these will be a top priority. As noted above, spatial data for crown height, crown base height, and crown bulk density will be developed before the next execution of FlamMap. Two datasets identified as inputs to the Asset Analyzer and not yet developed are Fire Fighter Safety and Structures. Current ArcIMS map services access Geomac road data to take advantage of higher resolution and improved attributes.

Web Site Update
Pat Lineback presented a demonstration of the SSGIC Web site at http://ssgic.cr.usgs.gov. Significant progress has been made in its development. In addition to the previously available overview maps, map services are now available for the FOA and FRID. In addition, a Kern County Fire Department map service is available. Most of the data contributing to the map services are also available for download with associated metadata. SSGIC program documentation is also posted.

Upcoming Meetings
The following activities are scheduled for the SSGIC in the upcoming months.

- April 30/May 1, 2002 – Fire and Fuels Data Management workshop
- May 15, 2002 – Principal Investigator's meeting
- October 2, 2002 – Interagency fuels planning group meeting
- October 3, 2002 – General SSGIC meeting

Appendix A
SSGIC Meeting Participants, 4/17/2002

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